

WEDNESDAY 10:40 A.M. GOLD ROOM

SESSION 15. Physical Properties of Biological Materials — Chairman: H. Schwan

15-5. Conductivity versus Frequency in Human and Feline Cerebrospinal Fluid

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Rheoencephalography consists in tracing the a.c. current conductivity registering the fluctuations in arterial cranial circulation. To determine the origin of these tracings it is necessary to measure the specific resistance of different living animal and human tissues. One of the theories on R.E.G. considers the rheographic recordings as changes arising from the cerebrospinal fluid shift rather than the inflow of blood. Due to the multitude of various frequencies used in rheography or impedance plethysmography, a set of experiments was done with conductivity measurements using a.c. current ranging from 1-30 Kc. For comparison's sake, two different spinal fluids were examined: human and feline. Neither one nor the other c.s.f. shows a strong frequency dependence in their respective conductivities. Moreover, the difference in conductivity in these two is less than 3% over the above mentioned range. The values shown in the table were measured at 24.5° C as this was the most convenient temperature to maintain with available equipment.

A study was also made of the temperature dependence of conductivity for human c.s.f. and the value of approximately 1.9 mho per Degree Centigrade. This is based on the conductivity of human c.s.f. or 20.5 milimho per centimeter at a frequency of 1 Kc.

Were it true that during the intracranial pulse wave the cerebrospinal fluid is replaced by blood, which has about twice the resistance of c.s.f., then higher impedance and lower conductivity should result. In fact - just the opposite changes are observed and recorded in rheoencephalography.

Freq. (Kc)	Man Conductivity	Cat Conductivity
1	15.57	15.14
2	15.59	15.19
3	15.61	15.21
4	15.62	15.22
5	15.58	15.24
6	15.59	15.25
7	15.57	15.25
8	15.57	15.27
9	15.57	15.27
10	15.54	15.27
11	15.54	15.26
12	15.54	15.25
13	15.54	15.25
14	15.52	15.24
15	15.53	15.23
16	15.49	15.23
17	15.49	15.23
18	15.45	15.23
19	15.44	15.23
20	15.43	15.23
21	15.40	15.23
22	15.40	15.23
23	15.38	15.23
24	15.37	15.23
25	15.38	15.23
26	15.38	15.23
27	15.39	15.23
28	15.38	15.23
29	15.36	15.23
30	15.35	15.23

Conductivities are in millimhos per cm.

References

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3. SCHWAN, H.P., KAY, C.F. "Specific Resistance of Body Tissues"; Circulation Res., 4; 664-670, 1956
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N 65 89581
(ACCESSION NUMBER) (THRU)
1
(PAGES) (CODE)
CR 67868
(NASA CR OR TMX OR AD NUMBER) (CATEGORY)

* Supported by NASA Grant NSG 388